



SEQUENCE LISTING

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<120> PRODUCTION OF SYRINGYL LIGNIN IN GYMNOSPERMS

<130> 044463-0336

<140> 10/681,878

<141> 2003-10-09

<150> 09/796,256

<151> 2001-02-28

<150> 08/991,677

<151> 1997-12-16

<150> 60/033,381

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<160> 24

<170> PatentIn Ver. 3.3

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<213> Liquidambar styraciflua

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<222> (48)..(1571)

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ctt cta ata ccc atc tca ata atc ttc atc gtc tta gct tac cag ctc 104
Leu Leu Ile Pro Ile Ser Ile Ile Phe Ile Val Leu Ala Tyr Gln Leu
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tat caa cgg ctc aga ttt aag ctc cca ccc ggc cca cgt cca tgg ccg 152
Tyr Gln Arg Leu Arg Phe Lys Leu Pro Pro Gly Pro Arg Pro Trp Pro
  20                25                30                35

atc gtc gga aac ctt tac gac ata aaa ccg gtg agg ttc cgg tgt ttc 200
Ile Val Gly Asn Leu Tyr Asp Ile Lys Pro Val Arg Phe Arg Cys Phe
           40                45                50

gcc gag tgg tca caa gcg tac ggt ccg atc ata tcg gtg tgg ttc ggt 248
Ala Glu Trp Ser Gln Ala Tyr Gly Pro Ile Ile Ser Val Trp Phe Gly
           55                60                65
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70 75 80	
ctc aag gaa aaa gat caa caa ttg gct gat agg cat agg agt aga tca Leu Lys Glu Lys Asp Gln Gln Leu Ala Asp Arg His Arg Ser Arg Ser	344
85 90 95	
gct gcc aaa ttt agc agg gat ggg cag gac ctt ata tgg gct gat tat Ala Ala Lys Phe Ser Arg Asp Gly Gln Asp Leu Ile Trp Ala Asp Tyr	392
100 105 110 115	
gga cct cac tat gtg aag gtt aca aag gtt tgt acc ctc gag ctt ttt Gly Pro His Tyr Val Lys Val Thr Lys Val Cys Thr Leu Glu Leu Phe	440
120 125 130	
act cca aag cgg ctt gaa gct ctt aga ccc att aga gaa gat gaa gtt Thr Pro Lys Arg Leu Glu Ala Leu Arg Pro Ile Arg Glu Asp Glu Val	488
135 140 145	
aca gcc atg gtt gag tcc att ttt aat gac act gcg aat cct gaa aat Thr Ala Met Val Glu Ser Ile Phe Asn Asp Thr Ala Asn Pro Glu Asn	536
150 155 160	
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165 170 175	
aac aac att aca aga ctc gca ttt gga aag cga ttc gtg aat tca gag Asn Asn Ile Thr Arg Leu Ala Phe Gly Lys Arg Phe Val Asn Ser Glu	632
180 185 190 195	
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200 205 210	
gga ctc aag ctt ggt gcc tca ctt gca atg gct gag cac att cct tgg Gly Leu Lys Leu Gly Ala Ser Leu Ala Met Ala Glu His Ile Pro Trp	728
215 220 225	
ctc cgt tgg atg ttc cca ctt gag gaa ggg gcc ttt gcc aag cat ggg Leu Arg Trp Met Phe Pro Leu Glu Glu Gly Ala Phe Ala Lys His Gly	776
230 235 240	
gca cgt agg gac cga ctt acc aga gct atc atg gaa gag cac aca ata Ala Arg Arg Asp Arg Leu Thr Arg Ala Ile Met Glu Glu His Thr Ile	824
245 250 255	
gcc cgt aaa aag agt ggt gga gcc caa caa cat ttc gtg gat gca ttg Ala Arg Lys Lys Ser Gly Gly Ala Gln Gln His Phe Val Asp Ala Leu	872
260 265 270 275	
ctc acc cta caa gag aaa tat gac ctt agc gag gac act att att ggg Leu Thr Leu Gln Lys Tyr Asp Leu Ser Glu Asp Thr Ile Ile Gly	920
280 285 290	

ctc ctt tgg gat atg atc act gca ggc atg gac aca acc gca atc tct	968
Leu Leu Trp Asp Met Ile Thr Ala Gly Met Asp Thr Thr Ala Ile Ser	
295 300 305	
gtc gaa tgg gcc atg gcc gag tta att aag aac cca agg gtg caa caa	1016
Val Glu Trp Ala Met Ala Glu Leu Ile Lys Asn Pro Arg Val Gln Gln	
310 315 320	
aaa gct caa gag gag cta gac aat gta ctt ggg tcc gaa cgt gtc ctg	1064
Lys Ala Gln Glu Glu Leu Asp Asn Val Leu Gly Ser Glu Arg Val Leu	
325 330 335	
acc gaa ttg gac ttc tca agc ctc cct tat cta caa tgt gta gcc aag	1112
Thr Glu Leu Asp Phe Ser Ser Leu Pro Tyr Leu Gln Cys Val Ala Lys	
340 345 350 355	
gag gca cta agg ctg cac cct cca aca cca cta atg ctc cct cat cgc	1160
Glu Ala Leu Arg Leu His Pro Pro Thr Pro Leu Met Leu Pro His Arg	
360 365 370	
gcc aat gcc aac gtc aaa att ggt ggc tac gac atc cct aag gga tca	1208
Ala Asn Ala Asn Val Lys Ile Gly Gly Tyr Asp Ile Pro Lys Gly Ser	
375 380 385	
aat gtt cat gta aat gtc tgg gcc gtg gct cgt gat cca gca gtg tgg	1256
Asn Val His Val Asn Val Trp Ala Val Ala Arg Asp Pro Ala Val Trp	
390 395 400	
cgt gac cca cta gag ttt cga ccg gaa cgg ttc tct gaa gac gat gtc	1304
Arg Asp Pro Leu Glu Phe Arg Pro Glu Arg Phe Ser Glu Asp Asp Val	
405 410 415	
gac atg aaa ggt cac gat tat agg cta ctg ccg ttt ggt gca ggg agg	1352
Asp Met Lys Gly His Asp Tyr Arg Leu Leu Pro Phe Gly Ala Gly Arg	
420 425 430 435	
cgt gtt tgc ccc ggt gca caa ctt ggc atc aat ttg gtc aca tcc atg	1400
Arg Val Cys Pro Gly Ala Gln Leu Gly Ile Asn Leu Val Thr Ser Met	
440 445 450	
atg ggt cac cta ttg cac cat ttc tat tgg agc cct cct aaa ggt gta	1448
Met Gly His Leu Leu His His Phe Tyr Trp Ser Pro Pro Lys Gly Val	
455 460 465	
aaa cca gag gag att gac atg tca gag aat cca gga ttg gtc acc tac	1496
Lys Pro Glu Glu Ile Asp Met Ser Glu Asn Pro Gly Leu Val Thr Tyr	
470 475 480	
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Met Arg Thr Pro Val Gln Ala Val Pro Thr Pro Arg Leu Pro Ala His	
485 490 495	
ttg tac aaa cgt gta gct gtg gat atg taattcttag tttgttatta	1591
Leu Tyr Lys Arg Val Ala Val Asp Met	
500 505	
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<212> PRT

<213> Liquidambar styraciflua

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      20           25           30

Pro Trp Pro Ile Val Gly Asn Leu Tyr Asp Ile Lys Pro Val Arg Phe
      35           40           45

Arg Cys Phe Ala Glu Trp Ser Gln Ala Tyr Gly Pro Ile Ile Ser Val
      50           55           60

Trp Phe Gly Ser Thr Leu Asn Val Ile Val Ser Asn Ser Glu Leu Ala
      65           70           75           80

Lys Glu Val Leu Lys Glu Lys Asp Gln Gln Leu Ala Asp Arg His Arg
      85           90           95

Ser Arg Ser Ala Ala Lys Phe Ser Arg Asp Gly Gln Asp Leu Ile Trp
      100          105          110

Ala Asp Tyr Gly Pro His Tyr Val Lys Val Thr Lys Val Cys Thr Leu
      115          120          125

Glu Leu Phe Thr Pro Lys Arg Leu Glu Ala Leu Arg Pro Ile Arg Glu
      130          135          140

Asp Glu Val Thr Ala Met Val Glu Ser Ile Phe Asn Asp Thr Ala Asn
      145          150          155          160

Pro Glu Asn Tyr Gly Lys Ser Met Leu Val Lys Lys Tyr Leu Gly Ala
      165          170          175

Val Ala Phe Asn Asn Ile Thr Arg Leu Ala Phe Gly Lys Arg Phe Val
      180          185          190

Asn Ser Glu Gly Val Met Asp Glu Gln Gly Leu Glu Phe Lys Glu Ile
      195          200          205

Val Ala Asn Gly Leu Lys Leu Gly Ala Ser Leu Ala Met Ala Glu His
      210          215          220

Ile Pro Trp Leu Arg Trp Met Phe Pro Leu Glu Glu Gly Ala Phe Ala
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Lys His Gly Ala Arg Arg Asp Arg Leu Thr Arg Ala Ile Met Glu Glu
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His Thr Ile Ala Arg Lys Lys Ser Gly Gly Ala Gln Gln His Phe Val
 260 265 270
 Asp Ala Leu Leu Thr Leu Gln Glu Lys Tyr Asp Leu Ser Glu Asp Thr
 275 280 285
 Ile Ile Gly Leu Leu Trp Asp Met Ile Thr Ala Gly Met Asp Thr Thr
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 Ala Ile Ser Val Glu Trp Ala Met Ala Glu Leu Ile Lys Asn Pro Arg
 305 310 315 320
 Val Gln Gln Lys Ala Gln Glu Glu Leu Asp Asn Val Leu Gly Ser Glu
 325 330 335
 Arg Val Leu Thr Glu Leu Asp Phe Ser Ser Leu Pro Tyr Leu Gln Cys
 340 345 350
 Val Ala Lys Glu Ala Leu Arg Leu His Pro Pro Thr Pro Leu Met Leu
 355 360 365
 Pro His Arg Ala Asn Ala Asn Val Lys Ile Gly Gly Tyr Asp Ile Pro
 370 375 380
 Lys Gly Ser Asn Val His Val Asn Val Trp Ala Val Ala Arg Asp Pro
 385 390 395 400
 Ala Val Trp Arg Asp Pro Leu Glu Phe Arg Pro Glu Arg Phe Ser Glu
 405 410 415
 Asp Asp Val Asp Met Lys Gly His Asp Tyr Arg Leu Leu Pro Phe Gly
 420 425 430
 Ala Gly Arg Arg Val Cys Pro Gly Ala Gln Leu Gly Ile Asn Leu Val
 435 440 445
 Thr Ser Met Met Gly His Leu Leu His His Phe Tyr Trp Ser Pro Pro
 450 455 460
 Lys Gly Val Lys Pro Glu Glu Ile Asp Met Ser Glu Asn Pro Gly Leu
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 <222> (74)..(1606)

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ccc atg acg ctg ttc ttc att ata cct ttg cta ctc tta ttg ggc cta 157
Pro Met Thr Leu Phe Phe Ile Ile Pro Leu Leu Leu Leu Leu Gly Leu
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gta tct cgg ctt cgc cag aga cta cca tac cca cca ggc cca aaa ggc 205
Val Ser Arg Leu Arg Gln Arg Leu Pro Tyr Pro Pro Gly Pro Lys Gly
          30              35              40

tta ccg gtg atc gga aac atg ctc atg atg gat caa ctc act cac cga 253
Leu Pro Val Ile Gly Asn Met Leu Met Met Asp Gln Leu Thr His Arg
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gga ctc gcc aaa ctc gcc aaa caa tac ggc ggt cta ttc cac ctc aag 301
Gly Leu Ala Lys Leu Ala Lys Gln Tyr Gly Gly Leu Phe His Leu Lys
          65              70              75

atg gga ttc tta cac atg gtg gcc gtt tcc aca ccc gac atg gct cgc 349
Met Gly Phe Leu His Met Val Ala Val Ser Thr Pro Asp Met Ala Arg
          80              85              90

caa gtc ctt caa gtc caa gac aac atc ttc tcg aac cgg cca gcc acc 397
Gln Val Leu Gln Val Gln Asp Asn Ile Phe Ser Asn Arg Pro Ala Thr
          95              100              105

ata gcc atc agc tac ctc acc tat gac cga gcc gac atg gcc ttc gct 445
Ile Ala Ile Ser Tyr Leu Thr Tyr Asp Arg Ala Asp Met Ala Phe Ala
          110              115              120

cac tac ggc ccg ttt tgg cgt cag atg cgt aaa ctc tgc gtc atg aaa 493
His Tyr Gly Pro Phe Trp Arg Gln Met Arg Lys Leu Cys Val Met Lys
          125              130              135              140

tta ttt agc cgg aaa cga gcc gag tcg tgg gag tcg gtc cga gac gag 541
Leu Phe Ser Arg Lys Arg Ala Glu Ser Trp Glu Ser Val Arg Asp Glu
          145              150              155

gtc gac tcg gca gta cga gtg gtc gcg tcc aat att ggg tcg acg gtg 589
Val Asp Ser Ala Val Arg Val Val Ala Ser Asn Ile Gly Ser Thr Val
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aat atc ggc gag ctg gtt ttt gct ctg acg aag aat att act tac agg 637
Asn Ile Gly Glu Leu Val Phe Ala Leu Thr Lys Asn Ile Thr Tyr Arg
          175              180              185

gcg gct ttt ggg acg atc tcg cat gag gac cag gac gag ttc gtg gcc 685
Ala Ala Phe Gly Thr Ile Ser His Glu Asp Gln Asp Glu Phe Val Ala
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205 210 215 220	
ttt atc cct tgg ctc aaa tgg gtt cct cag ggg att aac gtc agg ctc	781
Phe Ile Pro Trp Leu Lys Trp Val Pro Gln Gly Ile Asn Val Arg Leu	
225 230 235	
aac aag gca cga ggg gcg ctt gat ggg ttt att gac aag atc atc gac	829
Asn Lys Ala Arg Gly Ala Leu Asp Gly Phe Ile Asp Lys Ile Ile Asp	
240 245 250	
gat cat ata cag aag ggg agt aaa aac tgc gag gag gtt gat act gat	877
Asp His Ile Gln Lys Gly Ser Lys Asn Ser Glu Glu Val Asp Thr Asp	
255 260 265	
atg gta gat gat tta ctt gct ttt tac ggt gag gaa gcc aaa gta agc	925
Met Val Asp Asp Leu Leu Ala Phe Tyr Gly Glu Glu Ala Lys Val Ser	
270 275 280	
gaa tct gac gat ctt caa aat tcc atc aaa ctc acc aaa gac aac atc	973
Glu Ser Asp Asp Leu Gln Asn Ser Ile Lys Leu Thr Lys Asp Asn Ile	
285 290 295 300	
aaa gct atc atg gac gta atg ttt gga ggg acc gaa acg gtg gcg tcc	1021
Lys Ala Ile Met Asp Val Met Phe Gly Gly Thr Glu Thr Val Ala Ser	
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gcg att gaa tgg gcc atg acg gag ctg atg aaa agc cca gaa gat cta	1069
Ala Ile Glu Trp Ala Met Thr Glu Leu Met Lys Ser Pro Glu Asp Leu	
320 325 330	
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Lys Lys Val Gln Gln Glu Leu Ala Val Val Val Gly Leu Asp Arg Arg	
335 340 345	
gtc gaa gag aaa gac ttc gag aag ctc acc tac ttg aaa tgc gta ctg	1165
Val Glu Glu Lys Asp Phe Glu Lys Leu Thr Tyr Leu Lys Cys Val Leu	
350 355 360	
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Lys Glu Val Leu Arg Leu His Pro Pro Ile Pro Leu Leu Leu His Glu	
365 370 375 380	
act gcc gag gac gcc gag gtc ggc ggc tac tac att ccg gcg aaa tgc	1261
Thr Ala Glu Asp Ala Glu Val Gly Gly Tyr Tyr Ile Pro Ala Lys Ser	
385 390 395	
cgg gtg atg atc aac gcg tgc gcc atc ggc cgg gac aag aac tgc tgg	1309
Arg Val Met Ile Asn Ala Cys Ala Ile Gly Arg Asp Lys Asn Ser Trp	
400 405 410	
gcc gac cca gat acg ttt agg ccc tcc agg ttt ctc aaa gac ggt gtg	1357
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415 420 425	

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cgt cgg tct tgc ccc ggt atg caa ctc gga ctc tac gcg cta gag acg      1453
Arg Arg Ser Cys Pro Gly Met Gln Leu Gly Leu Tyr Ala Leu Glu Thr
445                      450                      455                      460

act gtg gct cac ctc ctt cac tgt ttc acg tgg gag ttg ccg gac ggg      1501
Thr Val Ala His Leu Leu His Cys Phe Thr Trp Glu Leu Pro Asp Gly
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atg aaa ccg agt gaa ctc gag atg aat gat gtg ttt gga ctc acc gcg      1549
Met Lys Pro Ser Glu Leu Glu Met Asn Asp Val Phe Gly Leu Thr Ala
                      480                      485                      490

cca aga gcg att cga ctc acc gcc gtg ccg agt cca cgc ctt ctc tgt      1597
Pro Arg Ala Ile Arg Leu Thr Ala Val Pro Ser Pro Arg Leu Leu Cys
                      495                      500                      505

cct ctc tat tgatcgaatg attgggggag ctttgtggag gggcttttat      1646
Pro Leu Tyr
    510

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atatattggg gagggagggg aaaaaaaaaa taatgaaagg aaagaaaaga gagaatttga 1766

atttctcttc ctctgtggat aaaagcctcg tttttaattg tttttatgtg gagatatttg 1826

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                20                      25                      30

Arg Gln Arg Leu Pro Tyr Pro Pro Gly Pro Lys Gly Leu Pro Val Ile
    35                      40                      45

Gly Asn Met Leu Met Met Asp Gln Leu Thr His Arg Gly Leu Ala Lys
    50                      55                      60

Leu Ala Lys Gln Tyr Gly Gly Leu Phe His Leu Lys Met Gly Phe Leu
    65                      70                      75                      80

His Met Val Ala Val Ser Thr Pro Asp Met Ala Arg Gln Val Leu Gln
                85                      90                      95

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Tyr	Leu	Thr	Tyr	Asp	Arg	Ala	Asp	Met	Ala	Phe	Ala	His	Tyr	Gly	Pro
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Phe	Trp	Arg	Gln	Met	Arg	Lys	Leu	Cys	Val	Met	Lys	Leu	Phe	Ser	Arg
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Lys	Arg	Ala	Glu	Ser	Trp	Glu	Ser	Val	Arg	Asp	Glu	Val	Asp	Ser	Ala
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Val	Arg	Val	Val	Ala	Ser	Asn	Ile	Gly	Ser	Thr	Val	Asn	Ile	Gly	Glu
			165						170			175			
Leu	Val	Phe	Ala	Leu	Thr	Lys	Asn	Ile	Thr	Tyr	Arg	Ala	Ala	Phe	Gly
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Thr	Ile	Ser	His	Glu	Asp	Gln	Asp	Glu	Phe	Val	Ala	Ile	Leu	Gln	Glu
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Phe	Ser	Gln	Leu	Phe	Gly	Ala	Phe	Asn	Ile	Ala	Asp	Phe	Ile	Pro	Trp
			210			215						220			
Leu	Lys	Trp	Val	Pro	Gln	Gly	Ile	Asn	Val	Arg	Leu	Asn	Lys	Ala	Arg
			225			230			235			240			
Gly	Ala	Leu	Asp	Gly	Phe	Ile	Asp	Lys	Ile	Ile	Asp	Asp	His	Ile	Gln
			245						250			255			
Lys	Gly	Ser	Lys	Asn	Ser	Glu	Glu	Val	Asp	Thr	Asp	Met	Val	Asp	Asp
			260			265						270			
Leu	Leu	Ala	Phe	Tyr	Gly	Glu	Glu	Ala	Lys	Val	Ser	Glu	Ser	Asp	Asp
			275			280						285			
Leu	Gln	Asn	Ser	Ile	Lys	Leu	Thr	Lys	Asp	Asn	Ile	Lys	Ala	Ile	Met
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Asp	Val	Met	Phe	Gly	Gly	Thr	Glu	Thr	Val	Ala	Ser	Ala	Ile	Glu	Trp
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Ala	Met	Thr	Glu	Leu	Met	Lys	Ser	Pro	Glu	Asp	Leu	Lys	Lys	Val	Gln
			325						330			335			
Gln	Glu	Leu	Ala	Val	Val	Val	Gly	Leu	Asp	Arg	Arg	Val	Glu	Glu	Lys
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Asp	Phe	Glu	Lys	Leu	Thr	Tyr	Leu	Lys	Cys	Val	Leu	Lys	Glu	Val	Leu
			355			360			365						
Arg	Leu	His	Pro	Pro	Ile	Pro	Leu	Leu	Leu	His	Glu	Thr	Ala	Glu	Asp
			370			375			380						
Ala	Glu	Val	Gly	Gly	Tyr	Tyr	Ile	Pro	Ala	Lys	Ser	Arg	Val	Met	Ile
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Met Gly Ser Thr Ser Glu Thr Lys Met Ser Pro Ser Glu Ala																	
1			5			10											
gca gca gca gaa gaa gaa gca ttc gta ttc gct atg caa tta acc agt																	156
Ala Ala Ala Glu Glu Glu Ala Phe Val Phe Ala Met Gln Leu Thr Ser																	
15			20			25			30								
gct tca gtt ctt ccc atg gtc cta aaa tca gcc ata gag ctc gac gtc																	204
Ala Ser Val Leu Pro Met Val Leu Lys Ser Ala Ile Glu Leu Asp Val																	
			35			40			45								
tta gaa atc atg gct aaa gct ggt cca ggt gcg cac ata tcc aca tct																	252
Leu Glu Ile Met Ala Lys Ala Gly Pro Gly Ala His Ile Ser Thr Ser																	
			50			55			60								
gac ata gcc tct aag ctg ccc aca aag aat cca gat gca gcc gtc atg																	300
Asp Ile Ala Ser Lys Leu Pro Thr Lys Asn Pro Asp Ala Ala Val Met																	
			65			70			75								
ctt gac cgt atg ctc cgc ctc ttg gct agc tac tct gtt cta acg tgc																	348
Leu Asp Arg Met Leu Arg Leu Leu Ala Ser Tyr Ser Val Leu Thr Cys																	
80			85			90											

tct ctc cgc acc ctc cct gac ggc aag atc gag agg ctt tac ggc ctt	396
Ser Leu Arg Thr Leu Pro Asp Gly Lys Ile Glu Arg Leu Tyr Gly Leu	
95 100 105 110	
gca ccc gtt tgt aaa ttc ttg acc aga aac gat gat gga gtc tcc ata	444
Ala Pro Val Cys Lys Phe Leu Thr Arg Asn Asp Asp Gly Val Ser Ile	
115 120 125	
gcc gct ctg tct ctc atg aat caa gac aag gtc ctc atg gag agc tgg	492
Ala Ala Leu Ser Leu Met Asn Gln Asp Lys Val Leu Met Glu Ser Trp	
130 135 140	
tac cac ttg acc gag gca gtt ctt gaa ggt gga att cca ttt aac aag	540
Tyr His Leu Thr Glu Ala Val Leu Glu Gly Gly Ile Pro Phe Asn Lys	
145 150 155	
gcc tat gga atg aca gca ttt gag tac cat ggc acc gat ccc aga ttc	588
Ala Tyr Gly Met Thr Ala Phe Glu Tyr His Gly Thr Asp Pro Arg Phe	
160 165 170	
aac aca gtt ttc aac aat gga atg tcc aat cat tcg acc att acc atg	636
Asn Thr Val Phe Asn Asn Gly Met Ser Asn His Ser Thr Ile Thr Met	
175 180 185 190	
aag aaa atc ctt gag act tac aaa ggg ttc gag gga ctt gga tct gtg	684
Lys Lys Ile Leu Glu Thr Tyr Lys Gly Phe Glu Gly Leu Gly Ser Val	
195 200 205	
gtt gat gtt ggt ggt ggc act ggt gcc cac ctt aac atg att atc gct	732
Val Asp Val Gly Gly Gly Thr Gly Ala His Leu Asn Met Ile Ile Ala	
210 215 220	
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Lys Tyr Pro Met Ile Lys Gly Ile Asn Phe Asp Leu Pro His Val Ile	
225 230 235	
gag gag gct ccc tcc tat cct ggt gtg gag cat gtt ggt gga gat atg	828
Glu Glu Ala Pro Ser Tyr Pro Gly Val Glu His Val Gly Gly Asp Met	
240 245 250	
ttt gtt agt gtt cca aaa gga gat gcc att ttc atg aag tgg ata tgt	876
Phe Val Ser Val Pro Lys Gly Asp Ala Ile Phe Met Lys Trp Ile Cys	
255 260 265 270	
cat gat tgg agc gat gaa cac tgc ttg aag ttt ttg aag aaa tgt tat	924
His Asp Trp Ser Asp Glu His Cys Leu Lys Phe Leu Lys Lys Cys Tyr	
275 280 285	
gaa gca ctt cca acc aat ggg aag gtg atc ctt gct gaa tgc atc ctc	972
Glu Ala Leu Pro Thr Asn Gly Lys Val Ile Leu Ala Glu Cys Ile Leu	
290 295 300	
ccc gtg gcg cca gac gca agc ctc ccc act aag gca gtg gtc cat att	1020
Pro Val Ala Pro Asp Ala Ser Leu Pro Thr Lys Ala Val Val His Ile	
305 310 315	

gat gtc atc atg ttg gct cat aac cca ggt ggg aaa gag aga act gag 1068
Asp Val Ile Met Leu Ala His Asn Pro Gly Gly Lys Glu Arg Thr Glu
320 325 330
aag gag ttt gag gcc ttg gcc aag ggg gct gga ttt gaa ggt ttc cga 1116
Lys Glu Phe Glu Ala Leu Ala Lys Gly Ala Gly Phe Glu Gly Phe Arg
335 340 345 350
gta gta gcc tcg tgc gct tac aat aca tgg atc atc gaa ttt ttg aag 1164
Val Val Ala Ser Cys Ala Tyr Asn Thr Trp Ile Ile Glu Phe Leu Lys
355 360 365
aag att tgagtcctta ctgggctttg agtacataat accaactcct tttgggttttc 1220
Lys Ile
gagattgtga ttgtgattgt gattgtctct ctttcgcagt tggccttatg atataatgta 1280
tcgttaactc gatcacagaa gtgcaaaaga cagtgaatgt acactgcttt ataaaaataaa 1340
aattttaaga ttttgattca tgtaaaaaaa aaaaaaaaaa 1380

<210> 6

<211> 368

<212> PRT

<213> Liquidambar styraciflua

<400> 6

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Ala Glu Glu Glu Ala Phe Val Phe Ala Met Gln Leu Thr Ser Ala Ser
20 25 30
Val Leu Pro Met Val Leu Lys Ser Ala Ile Glu Leu Asp Val Leu Glu
35 40 45
Ile Met Ala Lys Ala Gly Pro Gly Ala His Ile Ser Thr Ser Asp Ile
50 55 60
Ala Ser Lys Leu Pro Thr Lys Asn Pro Asp Ala Ala Val Met Leu Asp
65 70 75 80
Arg Met Leu Arg Leu Leu Ala Ser Tyr Ser Val Leu Thr Cys Ser Leu
85 90 95
Arg Thr Leu Pro Asp Gly Lys Ile Glu Arg Leu Tyr Gly Leu Ala Pro
100 105 110
Val Cys Lys Phe Leu Thr Arg Asn Asp Asp Gly Val Ser Ile Ala Ala
115 120 125
Leu Ser Leu Met Asn Gln Asp Lys Val Leu Met Glu Ser Trp Tyr His
130 135 140
Leu Thr Glu Ala Val Leu Glu Gly Gly Ile Pro Phe Asn Lys Ala Tyr
145 150 155 160

Gly Met Thr Ala Phe Glu Tyr His Gly Thr Asp Pro Arg Phe Asn Thr
 165 170 175
 Val Phe Asn Asn Gly Met Ser Asn His Ser Thr Ile Thr Met Lys Lys
 180 185 190
 Ile Leu Glu Thr Tyr Lys Gly Phe Glu Gly Leu Gly Ser Val Val Asp
 195 200 205
 Val Gly Gly Gly Thr Gly Ala His Leu Asn Met Ile Ile Ala Lys Tyr
 210 215 220
 Pro Met Ile Lys Gly Ile Asn Phe Asp Leu Pro His Val Ile Glu Glu
 225 230 235 240
 Ala Pro Ser Tyr Pro Gly Val Glu His Val Gly Gly Asp Met Phe Val
 245 250 255
 Ser Val Pro Lys Gly Asp Ala Ile Phe Met Lys Trp Ile Cys His Asp
 260 265 270
 Trp Ser Asp Glu His Cys Leu Lys Phe Leu Lys Lys Cys Tyr Glu Ala
 275 280 285
 Leu Pro Thr Asn Gly Lys Val Ile Leu Ala Glu Cys Ile Leu Pro Val
 290 295 300
 Ala Pro Asp Ala Ser Leu Pro Thr Lys Ala Val Val His Ile Asp Val
 305 310 315 320
 Ile Met Leu Ala His Asn Pro Gly Gly Lys Glu Arg Thr Glu Lys Glu
 325 330 335
 Phe Glu Ala Leu Ala Lys Gly Ala Gly Phe Glu Gly Phe Arg Val Val
 340 345 350
 Ala Ser Cys Ala Tyr Asn Thr Trp Ile Ile Glu Phe Leu Lys Lys Ile
 355 360 365

<210> 7
 <211> 2025
 <212> DNA
 <213> Liquidambar styraciflua

<220>
 <221> CDS
 <222> (60)..(1679)

<400> 7
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atg gag acc caa aca aaa caa gaa gaa atc ata tat cgg tcg aaa ctc 107
 Met Glu Thr Gln Thr Lys Gln Glu Glu Ile Ile Tyr Arg Ser Lys Leu
 1 5 10 15

ccc gat atc tac atc ccc aaa cac ctc cct tta cat tcg tat tgt ttc	155
Pro Asp Ile Tyr Ile Pro Lys His Leu Pro Leu His Ser Tyr Cys Phe	
20 25 30	
gag aac atc tca cag ttc ggc tcc cgc ccc tgt ctg atc aat ggc gca	203
Glu Asn Ile Ser Gln Phe Gly Ser Arg Pro Cys Leu Ile Asn Gly Ala	
35 40 45	
acg ggc aag tat tac aca tat gct gag gtt gag ctc att gcg cgc aag	251
Thr Gly Lys Tyr Tyr Thr Tyr Ala Glu Val Glu Leu Ile Ala Arg Lys	
50 55 60	
gtc gca tcc ggc ctc aac aaa ctc ggc gtt cga caa ggt gac atc atc	299
Val Ala Ser Gly Leu Asn Lys Leu Gly Val Arg Gln Gly Asp Ile Ile	
65 70 75 80	
atg ctt ttg cta ccc aac tcg ccg gag ttc gtg ttt tca att ctc ggc	347
Met Leu Leu Leu Pro Asn Ser Pro Glu Phe Val Phe Ser Ile Leu Gly	
85 90 95	
gca tcc tac cgc ggg gct gcc gcc acc gcc gca aac ccg ttt tat acc	395
Ala Ser Tyr Arg Gly Ala Ala Ala Thr Ala Ala Asn Pro Phe Tyr Thr	
100 105 110	
cct gcc gag atc agg aag caa gcc aaa acc tcc aac gcc agg ctt att	443
Pro Ala Glu Ile Arg Lys Gln Ala Lys Thr Ser Asn Ala Arg Leu Ile	
115 120 125	
atc aca cat gcc tgt tac tat gag aaa gtg aag gac ttg gtg gaa gag	491
Ile Thr His Ala Cys Tyr Tyr Glu Lys Val Lys Asp Leu Val Glu Glu	
130 135 140	
aac gtt gcc aag atc ata tgt ata gac tca ccc ccg gac ggt tgt ttg	539
Asn Val Ala Lys Ile Ile Cys Ile Asp Ser Pro Pro Asp Gly Cys Leu	
145 150 155 160	
cac ttc tcg gag ctg agt gag gcg gac gag aac gac atg ccc aat gta	587
His Phe Ser Glu Leu Ser Glu Ala Asp Glu Asn Asp Met Pro Asn Val	
165 170 175	
gag att gac ccc gat gat gtg gtg gcg ctg ccg tac tcg tca ggg acg	635
Glu Ile Asp Pro Asp Asp Val Val Ala Leu Pro Tyr Ser Ser Gly Thr	
180 185 190	
acg ggt tta cca aag ggg gtg atg cta aca cac aag gga caa gtg acg	683
Thr Gly Leu Pro Lys Gly Val Met Leu Thr His Lys Gly Gln Val Thr	
195 200 205	
agt gtg gcg caa cag gtg gac gga gag aat ccg aac ctg tat ata cat	731
Ser Val Ala Gln Gln Val Asp Gly Glu Asn Pro Asn Leu Tyr Ile His	
210 215 220	
agc gag gac gtg gtt ctg tgc gtg ttg cct ctg ttt cac atc tac tcg	779
Ser Glu Asp Val Val Leu Cys Val Leu Pro Leu Phe His Ile Tyr Ser	
225 230 235 240	

atg aac gtc atg ttt tgc ggg tta cga gtt ggt gcg gcg att ctg att	827
Met Asn Val Met Phe Cys Gly Leu Arg Val Gly Ala Ala Ile Leu Ile	
245 250 255	
atg cag aaa ttt gaa ata tat ggg ttg tta gag ctg gtc aga agt aca	875
Met Gln Lys Phe Glu Ile Tyr Gly Leu Leu Glu Leu Val Arg Ser Thr	
260 265 270	
ggt gac cat cat gcc tat cgt aca ccc atc gta ttg gca atc tcc aag	923
Gly Asp His His Ala Tyr Arg Thr Pro Ile Val Leu Ala Ile Ser Lys	
275 280 285	
act ccg gat ctt cac aac tat gat gtg tcc tcc att cgg act gtc atg	971
Thr Pro Asp Leu His Asn Tyr Asp Val Ser Ser Ile Arg Thr Val Met	
290 295 300	
tca ggt gcg gct cct ctg ggc aag gaa ctt gaa gat tct gtc aga gct	1019
Ser Gly Ala Ala Pro Leu Gly Lys Glu Leu Glu Asp Ser Val Arg Ala	
305 310 315 320	
aag ttt ccc acc gcc aaa ctt ggt cag gga tat gga atg acg gag gca	1067
Lys Phe Pro Thr Ala Lys Leu Gly Gln Gly Tyr Gly Met Thr Glu Ala	
325 330 335	
ggg ccc gtg cta gcg atg tgt ttg gca ttt gcc aag gaa ggg ttt gaa	1115
Gly Pro Val Leu Ala Met Cys Leu Ala Phe Ala Lys Glu Gly Phe Glu	
340 345 350	
ata aaa tcg ggg gca tct gga act gtt tta agg aac gca cag atg aag	1163
Ile Lys Ser Gly Ala Ser Gly Thr Val Leu Arg Asn Ala Gln Met Lys	
355 360 365	
att gtg gac cct gaa acc ggt gtc act ctc cct cga aac caa ccc gga	1211
Ile Val Asp Pro Glu Thr Gly Val Thr Leu Pro Arg Asn Gln Pro Gly	
370 375 380	
gag att tgc att aga gga gac caa atc atg aaa ggt tat ctt aat gat	1259
Glu Ile Cys Ile Arg Gly Asp Gln Ile Met Lys Gly Tyr Leu Asn Asp	
385 390 395 400	
cct gag gcg acg gag aga acc ata gac aag gaa ggt tgg tta cac aca	1307
Pro Glu Ala Thr Glu Arg Thr Ile Asp Lys Glu Gly Trp Leu His Thr	
405 410 415	
ggt gat gtg ggc tac atc gac gat gac act gag ctc ttc att gtt gat	1355
Gly Asp Val Gly Tyr Ile Asp Asp Thr Glu Leu Phe Ile Val Asp	
420 425 430	
cgg ttg aag gaa ctg atc aaa tac aaa ggg ttt cag gtg gca ccc gct	1403
Arg Leu Lys Glu Leu Ile Lys Tyr Lys Gly Phe Gln Val Ala Pro Ala	
435 440 445	
gag ctt gag gcc atg ctc ctc aac cat ccc aac atc tct gat gct gcc	1451
Glu Leu Glu Ala Met Leu Leu Asn His Pro Asn Ile Ser Asp Ala Ala	
450 455 460	

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gtc gtc cca atg aaa gac gat gaa gct gga gag ctc cct gtg gcg ttt 1499
Val Val Pro Met Lys Asp Asp Glu Ala Gly Glu Leu Pro Val Ala Phe
465                      470                      475                      480

gtt gta aga tca gat ggt tct cag ata tcc gag gct gaa atc agg caa 1547
Val Val Arg Ser Asp Gly Ser Gln Ile Ser Glu Ala Glu Ile Arg Gln
                      485                      490                      495

tac atc gca aaa cag gtg gtt ttt tat aaa aga ata cat cgc gta ttt 1595
Tyr Ile Ala Lys Gln Val Val Phe Tyr Lys Arg Ile His Arg Val Phe
                      500                      505                      510

ttc gtc gaa gcc att cct aaa gcg ccc tct ggc aaa atc ttg cgg aag 1643
Phe Val Glu Ala Ile Pro Lys Ala Pro Ser Gly Lys Ile Leu Arg Lys
                      515                      520                      525

gac ctg aga gcc aaa ttg gcg tct ggt ctt ccc aat taattctcat 1689
Asp Leu Arg Ala Lys Leu Ala Ser Gly Leu Pro Asn
                      530                      535                      540

tcgctaccct cctttctctt atcatcgcgc aacacgaacg aagaggctca attaaacgct 1749

gctcattcga agcggctcaa ttaaagctgc tcattcatgt ccaccgagtg ggcagcctgt 1809

cttggtggga tgttctttca tttgattcag ctgtgagaag ccagaccctc attattttatt 1869

gtgaaattca caagaatgtc tgtaaatacga tgttgtgagt gatgggtttc aaaacacttt 1929

tgacattgtt tacgttgtat ttctgtctgt tgaaaataac tactttgtat gactttttatt 1989

tggaagata acctttcaaa aaaaaaaaaa aaaaaa 2025

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<210> 8
<211> 540
<212> PRT
<213> Liquidambar styraciflua

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<400> 8
Met Glu Thr Gln Thr Lys Gln Glu Glu Ile Ile Tyr Arg Ser Lys Leu
  1                      5                      10                      15

Pro Asp Ile Tyr Ile Pro Lys His Leu Pro Leu His Ser Tyr Cys Phe
                20                      25                      30

Glu Asn Ile Ser Gln Phe Gly Ser Arg Pro Cys Leu Ile Asn Gly Ala
    35                      40                      45

Thr Gly Lys Tyr Tyr Thr Tyr Ala Glu Val Glu Leu Ile Ala Arg Lys
    50                      55                      60

Val Ala Ser Gly Leu Asn Lys Leu Gly Val Arg Gln Gly Asp Ile Ile
    65                      70                      75                      80

Met Leu Leu Leu Pro Asn Ser Pro Glu Phe Val Phe Ser Ile Leu Gly
                85                      90                      95

```


Ala	Ser	Tyr	Arg	Gly	Ala	Ala	Ala	Thr	Ala	Ala	Asn	Pro	Phe	Tyr	Thr	100	105	110	
Pro	Ala	Glu	Ile	Arg	Lys	Gln	Ala	Lys	Thr	Ser	Asn	Ala	Arg	Leu	Ile	115	120	125	
Ile	Thr	His	Ala	Cys	Tyr	Tyr	Glu	Lys	Val	Lys	Asp	Leu	Val	Glu	Glu	130	135	140	
Asn	Val	Ala	Lys	Ile	Ile	Cys	Ile	Asp	Ser	Pro	Pro	Asp	Gly	Cys	Leu	145	150	155	160
His	Phe	Ser	Glu	Leu	Ser	Glu	Ala	Asp	Glu	Asn	Asp	Met	Pro	Asn	Val	165	170	175	
Glu	Ile	Asp	Pro	Asp	Asp	Val	Val	Ala	Leu	Pro	Tyr	Ser	Ser	Gly	Thr	180	185	190	
Thr	Gly	Leu	Pro	Lys	Gly	Val	Met	Leu	Thr	His	Lys	Gly	Gln	Val	Thr	195	200	205	
Ser	Val	Ala	Gln	Gln	Val	Asp	Gly	Glu	Asn	Pro	Asn	Leu	Tyr	Ile	His	210	215	220	
Ser	Glu	Asp	Val	Val	Leu	Cys	Val	Leu	Pro	Leu	Phe	His	Ile	Tyr	Ser	225	230	235	240
Met	Asn	Val	Met	Phe	Cys	Gly	Leu	Arg	Val	Gly	Ala	Ala	Ile	Leu	Ile	245	250	255	
Met	Gln	Lys	Phe	Glu	Ile	Tyr	Gly	Leu	Leu	Glu	Leu	Val	Arg	Ser	Thr	260	265	270	
Gly	Asp	His	His	Ala	Tyr	Arg	Thr	Pro	Ile	Val	Leu	Ala	Ile	Ser	Lys	275	280	285	
Thr	Pro	Asp	Leu	His	Asn	Tyr	Asp	Val	Ser	Ser	Ile	Arg	Thr	Val	Met	290	295	300	
Ser	Gly	Ala	Ala	Pro	Leu	Gly	Lys	Glu	Leu	Glu	Asp	Ser	Val	Arg	Ala	305	310	315	320
Lys	Phe	Pro	Thr	Ala	Lys	Leu	Gly	Gln	Gly	Tyr	Gly	Met	Thr	Glu	Ala	325	330	335	
Gly	Pro	Val	Leu	Ala	Met	Cys	Leu	Ala	Phe	Ala	Lys	Glu	Gly	Phe	Glu	340	345	350	
Ile	Lys	Ser	Gly	Ala	Ser	Gly	Thr	Val	Leu	Arg	Asn	Ala	Gln	Met	Lys	355	360	365	
Ile	Val	Asp	Pro	Glu	Thr	Gly	Val	Thr	Leu	Pro	Arg	Asn	Gln	Pro	Gly	370	375	380	
Glu	Ile	Cys	Ile	Arg	Gly	Asp	Gln	Ile	Met	Lys	Gly	Tyr	Leu	Asn	Asp	385	390	395	400

[illegible]

```

attcaagaat tcaattgccc tgccctgctc tgctctgctt tgctcaactt attgatccct 1440
gctctggttt gttcaatttc ttgaccctcg ctgggttctg ctctggtttg cacactttct 1500
cgattatata agtcattttg gatccttgca aggaagagaa tatg 1544

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<210> 10
<211> 659
<212> DNA
<213> Pinus taeda

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<400> 10
aaacaccaat ttaatgggat ttcagatttg tatcccatgc tattgggctaa ggcatttttc 60
ttattgtaat ctaaccaatt ctaatttcca ccctggtgtg aactgactga caaatgcggt 120
ccgaaaacag cgaatgaaat gtctgggtga tcggtcaaac aagcgggtgg cgagagagcg 180
cgggtgttgg cctagccggg atgggggtag gtagacggcg tattaccggc gagttgtccg 240
aatggagttt tcggggtagg tagtaacgta gacgtcaatg gaaaaagtca taatctccgt 300
caaaaatcca accgctcctt cacatcgtag agttggtggc cacgggaccc tccaccact 360
cactcaatcg atcgctgcc gtggttgccc attattcaac catacgccac ttgactcttc 420
accaacaatt ccaggcgggc tttctataca atgtactgca caggaaaatc caatataaaa 480
agccggcctc tgcttccttc tcagtagccc ccagctcatt caattcttcc cactgcaggc 540
tacatttgtc agacacgttt tccgccattt ttcgcctgtt tctgcggaga atttgatcag 600
gttcggattg ggattgaatc aattgaaagg tttttatttt cagtatttcg atcgccatg 659

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<210> 11
<211> 2251
<212> DNA
<213> Pinus taeda

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<400> 11
ggcggggttg tgacatttat tcataaatc atctcaaac aagaaggatt tacaaaaata 60
aaagaaaaca aaattttcat cttaaacata attataattg tggtcacaaa attcaactt 120
aaaccttaa tataaagaat ttctttcaac aatacacttt aatcacactt tcttcaatca 180
caacctctc caacaaaatt aaaatagatt aataaataaa taaacttaac tatttaaaaa 240
aaaatattat acaaaattta taaaacttc aaaataaaca aactttttat acaaaattca 300
tcaaaacttt aaaataaagc taacactga aaatgtgagt acatttaaaa ggacgtgat 360
cacaaaaatt ttgaaaacat aaacaaactt gaaactctac cttttaagaa tgagtttgtc 420
gtctcattaa ctcatagtt ttatagttcg aatccaatta acgtatcttt tattttatgg 480
aataaggggtg ttttaataag tgattttggg attttttttag taattttatt gtgatattgt 540
atggagtttt taaaaatata tatatatata tatatttttg ggttgagttt acttaaaatt 600
tggaagggtg tggtagaagc tataaattga gttgtgaatg agtgttttat ggatttttta 660
agatgttaaa tttatatatg taattaaaat tttattttga ataacaaaaa ttataattgg 720
ataaaaaatt gttttgttaa atttagagta aaaatttcaa aatctaaaaa aattaaacac 780
tattattttt aaaaaatttg ttggtaaatt ttatcttata ttttaagttaa aatttagaaa 840
aaattaattt taaattaata aacttttgaa gtcaaatatt ccaaatattt tccaaaatat 900
taaactctatt ttgcattcaa aatacaattt aaataataaa acttcatgga atagattaac 960
caatttgatg aaaaaccaa aatctcaaat aaaattttaa ttacaaaaca ttatcaacat 1020
tatgatttca agaaagacaa taaccagttt ccaataaaat aaaaaacctc atggcccgta 1080
attaagatct catttaattaa ttcttatttt ttaatttttt tacatagaaa atatctttat 1140
attgtatcca agaaatatag aatgttctcg tccagggact attaatctcc aaacaagttt 1200
caaaatcatt acattaaagc tcatcatgtc atttgtggat tggaaattat attgtataag 1260
agaaatatag aatgttctcg tctagggact attaatttcc aaacaaattt caaaatcatt 1320
acattaaagc tcatcatgtc atttgtggat tggaaattag acaaaaaaaa tcccaaatat 1380
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tttattggaa tgaaggttga gttataaact ttcagtaatc caagtatctt cggtttttga 1560
agatactaaa tccattatat aataaaaaa cattttaaac accaatttaa tgggatttca 1620
gatttgatc ccattgctatt ggctaaggca tttttcttat tgtaattctaa ccaattctaa 1680

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tttccaccct ggtgtgaact gactgacaaa tgcggtccga aaacagcgaa tgaaatgtct 1740
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gggtaggtag acggcggtatt accggcgagt tgtccgaatg gagttttcgg ggtaggtagt 1860
aacgtagacg tcaatggaaa aagtcataat ctccgtcaaa aatccaaccg ctcttcaca 1920
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ccccagctca ttcaattctt ccactgcag gctacatttg tcagacacgt tttccgccat 2160
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ggtttttatt ttcagtattt cgatcgccat g 2251

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<210> 12

<211> 20

<212> PRT

<213> Artificial Sequence

<220>

<223> Description of Artificial Sequence: Synthetic peptide

<400> 12

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Gly Gly Met Ala Thr Tyr Cys Cys Ala Thr Thr Tyr Ala Ala Cys Ala
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Ala Gly Gly Cys
      20

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<210> 13

<211> 20

<212> PRT

<213> Artificial Sequence

<220>

<223> Description of Artificial Sequence: Synthetic peptide

<400> 13

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Ala Ala Ala Gly Ala Gly Ala Gly Asn Ala Cys Asn Asn Ala Asn Asn
 1             5             10             15

```

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Ala Asn Gly Ala
      20

```

<210> 14

<211> 31

<212> PRT

<213> Artificial Sequence

<220>

<223> Description of Artificial Sequence: Synthetic peptide

<400> 14

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Thr Thr Gly Gly Ala Thr Cys Cys Gly Gly Ile Ala Cys Ile Ala Cys
 1             5             10             15

```

Ile Gly Gly Ile Tyr Thr Ile Cys Cys Ile Ala Ala Arg Gly Gly
 20 25 30

<210> 15
 <211> 31
 <212> PRT
 <213> Artificial Sequence

<220>
 <223> Description of Artificial Sequence: Synthetic
 peptide

<400> 15
 Thr Thr Gly Gly Ala Thr Cys Cys Gly Thr Ile Gly Thr Ile Gly Cys
 1 5 10 15
 Ile Cys Ala Arg Cys Ala Arg Gly Thr Ile Gly Ala Tyr Gly Gly
 20 25 30

<210> 16
 <211> 27
 <212> PRT
 <213> Artificial Sequence

<220>
 <223> Description of Artificial Sequence: Synthetic
 peptide

<400> 16
 Cys Cys Ile Cys Thr Tyr Thr Ala Asp Ala Cys Arg Thr Ala Asp Gly
 1 5 10 15
 Cys Ile Cys Cys Ala Gly Cys Thr Gly Thr Ala
 20 25

<210> 17
 <211> 15
 <212> DNA
 <213> Artificial Sequence

<220>
 <223> Description of Artificial Sequence: Synthetic
 primer

<400> 17
 tttttttttt tttta

15

<210> 18
 <211> 15
 <212> DNA
 <213> Artificial Sequence

<220>

<223> Description of Artificial Sequence: Synthetic primer

<400> 18

ttttttttttt ttttc

15

<210> 19

<211> 15

<212> DNA

<213> Artificial Sequence

<220>

<223> Description of Artificial Sequence: Synthetic primer

<400> 19

ttttttttttt ttttg

15

<210> 20

<211> 13

<212> PRT

<213> Artificial Sequence

<220>

<223> Description of Artificial Sequence: Synthetic peptide

<400> 20

Cys Cys Asn Gly Gly Asn Gly Gly Ser Ala Arg Gly Ala
1 5 10

<210> 21

<211> 9

<212> PRT

<213> Artificial Sequence

<220>

<223> Description of Artificial Sequence: Synthetic peptide

<220>

<221> MOD_RES

<222> (3)

<223> Variable amino acid

<220>

<221> MOD_RES

<222> (5)..(6)

<223> Variable amino acid

<220>

<221> MOD_RES

<222> (8)

<223> Variable amino acid

<400> 21
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 1 5

<210> 22
 <211> 26
 <212> DNA
 <213> Artificial Sequence

<220>
 <223> Description of Artificial Sequence: Synthetic
 primer

<220>
 <221> modified_base
 <222> (23)
 <223> Inosine

<400> 22
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26

<210> 23
 <211> 26
 <212> DNA
 <213> Artificial Sequence

<220>
 <223> Description of Artificial Sequence: Synthetic
 primer

<400> 23
 atggctttcc ttctaatacc catctc

26

<210> 24
 <211> 26
 <212> DNA
 <213> Artificial Sequence

<220>
 <223> Description of Artificial Sequence: Synthetic
 primer

<400> 24
 ggggtgtaatg gacgagcaag gacttg

26